WHAT IS CLAIMED IS:

1. In a disk drive control circuit wherein, during normal operation, control logic controls a plurality of switching elements to provide electrical power to a spindle motor and head motor of the disk drive from a voltage source coupled to first and second voltage supply nodes, the spindle motor having a set of motor windings to which the electric power is applied to rotate the spindle motor, the improvement wherein:

the control logic is configured to enter a regenerative braking state during normal operation where the switching elements are controlled to isolate the spindle motor from the first voltage supply node and cause regenerative braking of the spindle motor so that kinetic energy due to rotation of the spindle motor is converted to electrical power that is supplied to the head motor by virtue of inductance of one or more motor windings in the set.

2. The improvement of claim 1 wherein:

said control logic is implemented in a self-contained HDD system having a battery;

said control logic is further configured to sense a commanded power-down condition, and in response to which causes regenerative braking of the spindle motor so that kinetic energy due to rotation of the spindle motor is converted to electrical power that is used to recharge the battery.

3. The improvement of claim 1 wherein said control logic is further configured to sense a condition where the spindle motor speed falls outside a desired range, and in so sensing, prevent the regenerative state from being entered.

4. The improvement of claim 1 wherein:

at least one of the switching elements is configured as part of a boost circuit coupled between the first voltage supply node and the head motor; and

the control logic activates said boost circuit during said regenerative braking state.

5. The improvement of claim 1 wherein the control logic enters said regenerative braking state for a seek operation to be performed by the disk drive.

6. The improvement of claim 1 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

the control logic is configured to enter regenerative braking states for at least some of said commutation states; and

the control logic enters respective regenerative braking states for each of a contiguous sequence of commutation states.

7. The improvement of claim 1 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

the control logic is configured to enter regenerative braking states for at least some of said commutation states; and

the control logic enters respective regenerative braking states for each of a non-contiguous sequence of commutation states.

8. In a circuit for controlling power supplied to a spindle motor and a head motor of a disk drive from a voltage source coupled to first and second voltage supply nodes, wherein during normal operation the circuit provides a conduction path through a switching element to a motor supply node, and includes a spindle motor drive circuit and a head drive motor drive circuit that provide conduction paths from the motor supply node to the second voltage supply node to energize the spindle motor and the head motor, the improvement comprising:

a control circuit that operates at specified times during normal operation to

cause the switching element to prevent current flow between the first voltage supply node and the motor supply node,

configure the spindle motor drive circuit to cease driving the spindle motor and allow the spindle motor to supply current to the motor supply node, and

configure the head motor drive circuit to energize the head motor with current flowing from said first voltage supply node and current supplied by the spindle motor.

9. The improvement of claim 8, and further comprising a boost circuit coupled between said first voltage supply node and said motor supply node.

10. The improvement of claim 9 wherein said control circuit further operates at said specified times during normal operation to activate the boost circuit to allow current to flow from the first voltage supply node to the motor supply node

11. The improvement of claim 9 wherein said boost circuit is a synchronous boost converter comprising an inductor and at least one switching element.

12. A circuit for controlling a spindle motor and a head motor of a disk drive, the circuit comprising:

first and second voltage supply nodes;

a switching element coupled between said first voltage supply node and a node, referred to as the motor supply node;

a spindle motor drive circuit coupled between said motor supply node and said second voltage supply node, said spindle motor drive circuit including nodes for coupling to respective spindle motor connection nodes;

a head motor drive circuit coupled between said motor supply node and said second voltage supply node, said head motor drive circuit including nodes for coupling to respective head motor connection nodes;

a boost circuit coupled between said first voltage supply node and said motor supply node; and

a control circuit coupled to said switching element, said spindle motor drive circuit, said head motor drive circuit, and said boost circuit;

said control circuit being configured with a set of one or more spindle motor drive states wherein:

said switching element is set to allow current flow between said first voltage supply node and said motor supply node,

said spindle motor drive circuit is configured to energize the spindle motor with current flowing between said motor supply node and said second voltage supply node, and

said boost circuit is not activated;

said control circuit being configured with a set of one or more regenerative braking states wherein:

said switching element is set to prevent current flow between said first voltage supply node and said motor supply node,

said spindle motor drive circuit is configured to allow the spindle motor to supply current to said motor supply node,

said boost circuit is activated to allow current to flow from said first voltage supply node to said motor supply node, and

said head motor drive circuit is configured to energize the head motor with current flowing from said first voltage supply node and current supplied by the spindle motor.

13. The circuit of claim 12 wherein said control circuit enters at least one of said regenerative braking states for a seek operation to be performed by the disk drive.

14. The circuit of claim 12 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

said set of regenerative braking states includes regenerative braking states for at least some of said commutation states; and

said control logic is configured to enter respective regenerative braking states for each of a contiguous sequence of commutation states.

15. The circuit of claim 12 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

said set of regenerative braking states includes regenerative braking states for at least some of said commutation states; and

said control logic is configured to enter respective regenerative braking states for each of a non-contiguous sequence of commutation states.

16. A hard disk drive circuit for controlling a spindle motor and a head motor, the circuit comprising:

first and second voltage supply nodes;

a selective isolation switching element coupled between said first voltage supply node and a node, referred to as the motor supply node;

first and second bridge circuits coupled in parallel between said motor supply node and said second voltage supply node;

said first bridge circuit including a plurality of parallel branches, each branch including at least one switching element and an intermediate spindle motor connection node for coupling to a respective node of the spindle motor;

said second bridge circuit having a plurality of parallel branches, each branch including at least one switching element and an intermediate head motor connection node for coupling to a respective node of the head motor;

each switching element having a respective control input responsive to input signals for controlling a state of that switching element;

a boost circuit coupled between said first voltage supply node and said motor supply node, said boost circuit having a control input; and

control logic coupled to said control input of said selective isolation switching element, to said control inputs of said switching elements in said first and second bridges, and to said control input of said boost circuit;

said control logic being configured to generate control signals during normal operation for operation in a set of one or more spindle motor drive states wherein:

said selective isolation switching element is set to allow current flow between said first voltage supply node and said motor supply node,

said first bridge circuit is configured to energize the spindle motor with current flowing between said motor supply node and said second voltage supply node, and

said boost circuit is not activated;

said control circuit being configured to generate control signals during normal operation for operation in a set of one or more regenerative braking states wherein:

said selective isolation switching element is set to prevent current flow between said first voltage supply node and said motor supply node,

said first bridge circuit is configured to allow the spindle motor to supply current to said motor supply node,

said boost circuit is activated to allow current to flow from said first voltage supply node to said motor supply node, and

said second bridge circuit is configured to energize the head motor with current flowing from said first voltage supply node and current supplied by the spindle motor.

17. The circuit of claim 16 wherein said control circuit is further configured to sense a condition where the spindle motor speed falls outside a desired range, and in so sensing, prevent the regenerative state from being entered .

18. The circuit of claim 16 wherein said control circuit enters at least one of said regenerative braking states for a seek operation to be performed by the disk drive.

19. The circuit of claim 16 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

said set of regenerative braking states includes regenerative braking states for at least some of said commutation states; and

said control logic is configured to generate control signals for operation in respective regenerative braking states for each of a contiguous sequence of commutation states.

20. The circuit of claim 16 wherein:

the spindle motor is a multi-phase motor having a plurality of commutation states;

said set of regenerative braking states includes regenerative braking states for at least some of said commutation states; and

said control logic is configured to generate control signals for operation in respective regenerative braking states for each of a non-contiguous sequence of commutation states.

21. The circuit of claim 16 wherein said boost circuit is a synchronous boost converter comprising an inductor and at least one switching element.

22. A chip set for use in a disk drive having a spindle motor and a head motor, the spindle motor having a set of motor windings to which electric power is applied to rotate the spindle motor, the chip set comprising:

a plurality of switching elements incorporated in one or more semiconductor devices; and

an integrated circuit device having drive control circuitry, wherein, during normal operation, said control logic controls said plurality of switching elements to provide electrical power to the spindle motor windings and the head motor from a voltage source coupled to first and second voltage supply nodes;

said control logic being configured to enter a regenerative braking state during normal operation, wherein:

at least one of the switching elements is controlled to isolate the spindle motor from the first voltage supply node; and

at least some of the switching elements are controlled to cause regenerative braking of the spindle motor so that kinetic energy due to rotation of the spindle motor is converted to electrical power that is supplied to the head motor by virtue of inductance of one or more motor windings in the set.

23. The chip set of claim 22 wherein said control logic is further configured to sense a condition where the spindle motor speed falls outside a desired range, and in so sensing, prevent the regenerative state from being entered .

24. The chip set of claim 22 wherein said plurality of switching elements are incorporated in a single semiconductor chip.

25. The chip set of claim 22 wherein said plurality of switching elements are incorporated in more than one semiconductor chip.

26. A disk drive comprising:

disk having concentric tracks for storing information;

a head for reading and/or writing information to said disk;

a spindle motor having a set of windings for rotating said disk in response to current supplied to said windings;

a head motor for moving said head to access selected tracks on said disk;

a spindle motor drive circuit;

a head motor drive circuit;

first and second voltage supply nodes for connection to a source of electrical power for said spindle motor and said head motor;

a switching element, referred to as the selective isolation switching element, coupled between said first supply node and an intermediate node, referred to as the motor supply node, said spindle motor drive circuit and said head motor drive circuit being coupled between said motor supply node and said second supply node;

motor control logic coupled to said spindle motor drive circuit, said head motor drive circuit, and said selective isolation switching element, said control logic being configured to enter a regenerative braking state during normal operation wherein

said selective switching element is controlled to isolate said spindle motor from said first voltage supply node;

said spindle motor drive circuit and said head motor drive circuit are controlled to cause regenerative braking of the spindle motor so that kinetic energy due to rotation of the spindle motor is converted to electrical power that is supplied to the head motor.